

**(3.3) Factored Form of a Quadratic** p. 150

- How to determine the zeros from an equation
- Given the zeros, determine the Quadratic equation in Factored Form

**THINK:** If 2 numbers are multiplied and equal '0' discuss the value of the numbers

$$ab = 0$$

Factored form of a quadratic relation is

$$y = a(x - r)(x - s)$$

- the **x-intercepts** are  $r$  and  $s$  (\*\*see note below)
- the equation of the **axis of symmetry**  $x = \frac{s + r}{2}$
- the **direction of opening** is determined from  $a$   
(if  $a < 0$ ,  $y$  opens down; if  $a > 0$ ,  $y$  opens up)

Apr 2-10:45 AM

**Example 1:** Given the quadratic equation  $y = -3(x - 4)(x + 6)$  determine,

a) the direction of opening

down  $\Rightarrow a \text{ value} \Rightarrow -3$

b) the y-intercept

sub in  $x = 0$

$$y = -3(0 - 4)(0 + 6) \Rightarrow y = 72$$

c) zeros

$$y = a(x - s)(x - r)$$

$$y = -3(x - 4)(x + 6)$$

$$s = 4 \quad r = -6$$

d) axis of symmetry

$$\frac{r + s}{2} \Rightarrow \frac{4 + (-6)}{2} = \frac{-2}{2} = -1$$

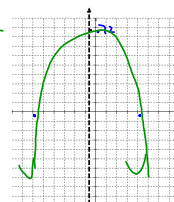
e) vertex

$$y = -3(x - 4)(x + 6)$$

$$= -3(-1 - 4)(-1 + 6)$$

$$= -3(-5)(+5) = +75$$

f) sketch the graph



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**Example 2:** Given the parabola on the right, determine

a) the zeros

$$s = -4$$

$$r = +5$$

b) the equation of the axis of symmetry

$$x = \frac{s + r}{2} = \frac{-4 + 5}{2} = \frac{1}{2} \quad x = \frac{1}{2}$$

c) the vertex

$$\left(\frac{1}{2}, 5\right)$$

x y

d) determine the equation of the parabola, in factored form

$$y = a(x - r)(x - s)$$

$$y = a(x - 5)(x + 4)$$

$$5 = a\left(\frac{1}{2} - 5\right)\left(\frac{1}{2} + 4\right)$$

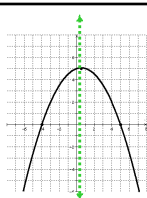
$$5 = a\left(\frac{-9}{2}\right)\left(\frac{9}{2}\right)$$

$$5 = a\left(\frac{-81}{4}\right)$$

$$45 = a(-81)$$

$$a = \frac{-20}{81}$$

$$y = \frac{-20}{81}(x - 5)(x + 4)$$



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**Example 3:** Given zeros at 3 and 7,

a) find the equation of the relation:

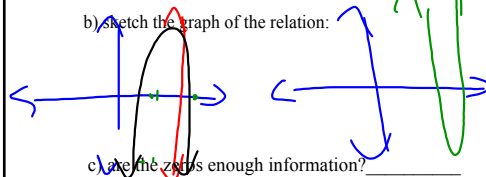
$$r = +3 \quad y = a(x - r)(x - s)$$

$$s = +7$$

$$y = a(x - 3)(x - 7)$$

$$x = 5$$

b) sketch the graph of the relation:



c) are the zeros enough information?

either  $a$  value  
another point!

d) why/why not?

i) graphically: \_\_\_\_\_

ii) algebraically: \_\_\_\_\_

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**Example 4:**

a) Find the equation of the parabola, in factored form, if  $a = -2$  and the x-intercepts are 8 and -6.

b) Find the vertex of the parabola.

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a) Find the equation of the parabola, in factored form, if  $a = -2$  and the x-intercepts are 8 and -6.

$$y = a(x - r)(x - s)$$

$$y = -2(x - 8)(x - (-6))$$

$$y = -2(x - 8)(x + 6)$$

b) Find the vertex of the parabola.

$$\frac{r + s}{2} = \frac{8 + 6}{2} = \frac{14}{2} = 7$$

$$y = -2(x - 8)(x + 6)$$

$$y = -2(7 - 8)(7 + 6)$$

$$y = -2(-1)(14)$$

$$y = +28$$

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**Example 5:**

The  $x$ -intercepts of a parabola are 0 and 7 and it passes through the point (2, -30). Determine,

a) the equation of the parabola, in factored form.

b) the vertex.

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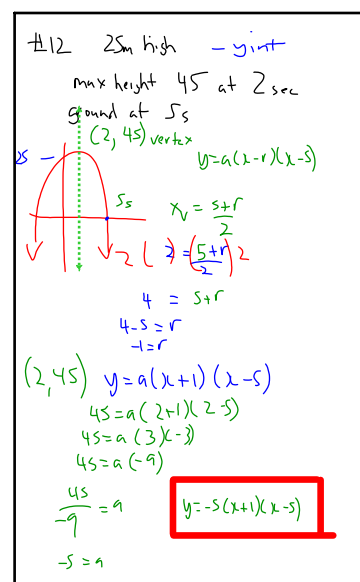


Oct 1-9:00 AM

## Homework

Pg. 155 # 1, 2, 4/5, 7, 8, 9, 11, 12

Mar 28-11:06 AM



Oct 20-10:25 AM